

**DO WORMS HAVE A GOD?**  
**MEANINGFUL CONVERSATION AND WRITING IN SCIENCE**

*Clare Seguin*  
*Lincoln Elementary School*

**Introduction**

"Maybe the apple floats because it has air inside it."  
"But if you cut an apple, it starts to turn brown."  
"Oh, yeah, that's because of the air touching it - that's what makes it turn  
brown"  
"Right, so if the apple has air inside it, it would already be brown even  
before you cut it open."  
"I guess that's true...but we still haven't figured out why it floats..."

One thing I love about teaching science is when conversations like this happen, when students are deeply engaged with trying to make sense of something - puzzling it out, building understanding. Those shining moments when students are really focused, listening to each other, playing off one another's ideas, times when it's not just the usual few chiming in, just seem so rare. One of my desires as a teacher has been to create an environment where rich, thoughtful conversations and writing take place on a regular basis. I want my students to feel compelled to speak and write about their ideas and to really listen to each other. I'd like to have my students spend as much time engaged in thinking and reflecting about their experiences as they spend *having* the experiences. This search for ways to inspire richer discussions and writing in my science class was the impetus for my action research.

**Background**

Lincoln is paired with Midvale School for purposes of integration. Midvale has the kindergarten, first and second grades and Lincoln has the third, fourth, and fifth grades. There is also a special program housed at Lincoln, the Open Classroom program, which has a K/1 class, a 2/3 class, and a 4/5 class. Because of these factors, most of my 21 classes are third, fourth, and fifth grades, with one K/1 and 2/3 class thrown into the mix.

The population at Lincoln is very diverse, with a steadily growing percentage of students qualifying for free and reduced lunch - currently at 68%. Our students are from African-American, Latin American, Hmong, Euro-American, and many other ethnic groups. A mix of cultural and socio-economic backgrounds is part of what drew me to Lincoln as well as what keeps me on my toes most days. It's a challenging school. Along with the social diversity come many differences in learning abilities, emotional health, and preparedness for the environment and culture of school. Many of my students come to school extraordinarily stressed, angry, and withdrawn. Because I'm dealing with so many students each day, each week, it's a constant struggle to know much at all about their lives outside my classroom.

Seven years ago, I went from being a regular classroom teacher to being the REACH teacher at Lincoln. I was compelled to take the position mostly for personal reasons - it was a 90% position at that time, and I needed the extra time to help care for my father. I knew I would miss having my "own" class, getting to know one group of individuals more deeply, but was also intrigued by the prospect of specializing in science, an area I'd always gravitated towards and enjoyed teaching.

I soon discovered that while I liked many aspects of the position, along with it came a new set of limitations I'd have to contend with. While it is fun getting to know all the students in the school, it is difficult to know them very well. Most years, I've had around 380 students. This is a huge change from have a class of 20 or so. Another problem is the limited time I spend with them - each class in the school comes to me for one hour a week. It's hard to build trust and get to know my students in that amount of time. It's also a huge challenge to develop continuity in their learning - it's hard to build clear connections between what we do from week to week.

Despite the limitations, I enjoy planning activities that I hope will be engaging, interesting, and which will in some way reinforce the science they're learning in their regular classroom. My emphasis is on processes and skills needed to do science such as observation, questioning, measurement, collecting, and interpreting data, and problem solving. We get at these through a variety of means and content areas, always through some kind of hands-on activity. While the hands-on element definitely has the power to pull students in, to get them involved with the class, I've never felt satisfied that they

were learning enough from the experiences, as evidenced by their writings and class discussions. This dissatisfaction is the source for my question.

### **The Question**

Action Research questions always seem to go through some process of mutation, but mine just took a little trip around the block. I'm back to the question I started with, after some minor adjustments. I initially felt that the aspect of my teaching that I most needed to work on in my science class was how to have more quality sharing and discussion about the ideas and thinking taking place. It bothered me when we'd do an interesting hands-on science activity, students would write in their journals, and then they'd have to go. Sometimes we'd squeeze in a little class discussion, but that was usually nothing but frustration, with a few willing to share ideas and the rest willing to interrupt or talk to someone else about something else. The most frustrating thing about it was that I knew kids were thinking and coming up with all kinds of great ideas and questions. I'd read them in their journals after they left or listen in as they were discussing in their groups, but it never felt as if we could get a good discussion going. I wanted to take a year to really hone in on improving this aspect of my practice.

As we discussed our questions in our CAR group, my colleagues encouraged me to limit the focus of my project to the practice of journaling. However, when I started collecting data and surveying my students, their responses and my reflections kept leading me back to looking at ways to get kids talking to each other in more interesting, fun, and effective ways as well as rethinking journals. So, I kept the question open, not limiting it to the journals, and looked into ways to keep the conversation going. The question I started and ended with is this, **"How can I increase the quality of sharing ideas and thinking in my science class?"**

### **The Journals**

A row of plastic boxes lines one wall of my classroom. Each box, one for each class, is stuffed with spiral-bound notebooks, one for each of my 400 or so students. These are their REACH journals. I use journal writing in a variety of ways - as a means to get students started thinking about a topic, as a way to assess background knowledge

of a subject, to record observations and data, and to explain ideas, conclusions, or reflections. Sometimes I ask students to read aloud their ideas from their journals, on a voluntary basis.

I chose to start my research by taking time to carefully analyze the current contents of the journals of two fifth-grade classes. I chose these classes because between the two of them, they reflect our student body as a whole, with students from diverse backgrounds, students with special needs such as ESL and learning disabilities. I chose to focus on fifth grade because many of the fifth graders have journal entries that go back to third and fourth grade, giving me a longer time span to examine.

I carefully re-read the journals of the two classes. It's not as if I'd never read them. At the end of most class sessions, I quickly go through the room and scan each student's journal. Reading more thoroughly, from beginning to the present, brought to my attention many issues, ideas, and questions. The journals as a source of data caused me to reflect on three main facets of my teaching: how to establish better connections with my students, improve curriculum, and enhance my students' academic achievement.

I was reminded of the power journals have to more deeply connect me with my students, by providing a more intimate means of communication. For example, a very quiet Hmong boy who doesn't call much attention to himself comes across in writing as a very intelligent, clever, at times funny kid. There are occasional notes to me in the journals, letting me in on their lives, such as, "I'm sorry I was so mad today...I just found out I have to move again this weekend." I found at least three places where students had written off in the margins, "Today is my birthday", and I feel guilty to say, I didn't catch it. Clearly, my students see their journals as a viable means of communicating with me, even though I don't respond to their entries. There are also examples of students using their journals to vent frustration with something - with school, other students, an activity, or me. Again, these unassigned writings can possibly offer me insight into the roots of some of their otherwise perplexing behaviors. This affective aspect to journals is something I miss about not having my own class. As a classroom teacher, I used dialog journals as a daily means of staying in touch with my students, as well as a way to encourage and develop their writing in an authentic way.

There were many instances where students expressed their feelings about the curriculum in their journals, unprompted - seemingly out of sheer inspiration and sometimes exasperation. Comments such as, "I like this!" "It was fun!" "We were all excited!" "This is too hard!" "I don't get it." and "Why do I have to do this?" can provide valuable feedback. At times, students seem to be moved by a particular experience and can't help but express their excitement in their writings, offering insight into the ways in which students respond to various projects. For example, after writing an assigned description, a student writes, "I really enjoyed it and looking at it. I think if I could do it again I would want to have more time. I think REACH will teach me what I need to know." There is so little time to effectively process an experience with my classes. These comments encourage me to try to build in more of this type of evaluative feedback, letting students help me shape the program toward more of what really captivates them.

What did I find out about the academic aspects of the journals? I found a fair amount of descriptive writing, in response to frequent prompts to "write an observation". Some of these passages are fantastic samples of descriptive writing - some students are much more motivated to write about an exciting science phenomenon than just about any other prompt. This raises many questions for me regarding connecting the literacy work of the regular classroom to the writing they're doing in REACH. Should I incorporate the "Six Traits" components of writing which are emphasized in literacy programming into their journaling? What are some ways to carry over the excitement and inspiration of a science experience into the "literacy block"? I'd love to see students using a topic brought up in REACH as the basis for writing in other genres - poetry, science fiction, etc..

At the beginning of a new unit, I will commonly prompt students to write what they know about the topic we are about to explore. This is useful to some degree; I can get an idea of where they are in terms of recalled content knowledge, and sometimes of misconceptions they might have. My hope is that it also just gets them thinking and wondering about the topic. A typical passage:

What I Know About Mold:

A mold is a type of food that grows hair. A mold smells really bad! A mold makes you sick. A mold makes taste bad. A mold comes in different colors. I think mold is something gross!

What I realized in reading through the journals is that, in the crush of time, we rarely take time to return to these writings to reflect on what they've (hopefully) learned about the subject in the interim. How can I more effectively use the journals to have students reflect on and see the gains they make in their learning?

### **The Survey**

Another technique I used was to survey students to gain insight into their attitudes and ideas about using journals. I was very curious to learn if they see any value in taking time for writing in science class. Does it help them organize their thinking? Does looking back through their journals help to reinforce prior learning? How do they feel about making their writing public? What are some ways they could share their ideas without feeling embarrassed?

Below, I've summarized the most common responses to the questions:

#### **1) Why do you think we have journals in REACH?**

- Sometimes we don't have time to talk about it, so we write.
- So we can put important things in it.
- Because that way we can make observations by writing.
- To write what you think and learned.
- So we can use the information another time.
- Because it helps us store knowledge, and you can view the way we think, and see how our minds work.
- To reflect on what we did that day.

#### **2) What does writing have to do with science?**

- To remember what we did and learned.
- When writing we can learn to take notes.
- A good scientist always writes down their research.
- It helps us record and understand what we are doing.
- So we know what we are learning.

- Recording stuff about science and to tell people about science.
- It's a way of figuring out stuff.

**3) Do you like it when I read your journal? Why or why not?**

- Yes, to get a better grade.
- No, it's my stuff.
- Yes, I like it because it helps you know if I'm doing my work or not.
- Sometimes yes if I have written my best of the whole day. But, if I have not done my best, I would not like it because I would feel very bad.
- Yes, you can understand my science skills better.
- Yes, because you can check over and tell if I did my work.
- Sometimes I don't like it because it's messed up.
- No, because I think it like our own thoughts and you shouldn't read them.
- Yes, I do like it because sometimes you give me advice about my journal.

**4) Do you like to read aloud from your journal? Why or why not?**

- No, because I don't like reading.
- No, because it feels very embarrassing.
- Yes, it makes me happy and feels good.
- Yes, so people can hear what I'm saying.
- Yes, it's fun!
- No, because some people just don't understand what I'm saying.
- Yes I do, that will give other people information that they can use.
- I do because I like it when people listen to me, and I like sharing my thoughts.
- Yes, because you can re-read and edit it if you did something wrong.

**5) How would you feel about reading your journal entries to a partner?**

- I would not like to read my entry to a partner unless I can trust them.
- It will feel okay because it's not that kind of embarrassing.
- Good because he knows what I am thinking of.
- Bad. (same students who said reading aloud is fun...)
- I would like it because I like to read to a partner then to the class.
- Yes, because I want to read to a partner to see if it makes sense to him.

- Nope, because if they say that's not right, I'll get scared.

What does this survey tell me? For one, doing this survey has reinforced for me just how interesting, useful, and important it is to take time to get feedback from my students and to provide them with opportunities to let me in on how they experience the class. It's one way to let them know that I respect and value their insights. Also, their answers provided me with some surprises and intriguing responses to puzzle over.

The first two questions yielded very similar responses. Most answers addressed at least one positive aspect of journaling, though the answers seem hasty and not as well thought out as I think students are capable of. In retrospect, it may have been better to ask students to list all the ways journals are useful in our class and how many ways they can come up with to describe how writing is connected to science.

One somewhat surprising result is that most students responded favorably to the third question and very much like it when I read their journals. It seems to be important to them to know that I am paying attention to their work and their thinking. Some felt differently, responding that they feel embarrassed or worried about being judged by me. Some felt their journals were private. I'd like to go back and interview some of those students one-on-one and see if I can gain more insight into why they're uncomfortable with me reading their journals.

As for reading aloud, responses were definitely more negative. Many students are vehemently against reading their writing aloud, citing fears of being laughed at, along with feeling shy and embarrassed. Some were positive and like to share their ideas - I'd imagine these are the ones who always raise their hands.

The responses to question 5, reading to a partner, were nearly evenly mixed pro and con. Many students expressed ambivalence about it, saying it would be just "ok" or only with certain people, people they could trust. Many students seem to be worried about the potential for criticism and derision from their peers. The interesting thing about this response is that it contrasts greatly with the ratings made in question 6. In their ratings, "talking with a partner" ranked among the most popular means of expression. I'm curious how they see talking with a partner as a much safer, more desirable activity than



sharing their writing. I wonder if they would be willing to simply paraphrase their writing to a partner, rather than read off the page?

Item number 6 asked students to rank in order from favorite to least favorite various ways of sharing their ideas and thinking. Highly ranked ways of sharing were drawing (no surprise there) and designing a model or invention. I often encourage students to draw their ideas or observations; many activities lend themselves very well to this. What I haven't done much of, however, is to teach explicitly about the role of drawing in the history of science. Students might be inspired to learn more about scientists such as Leonardo DaVinci whose work depended upon the ability to make elaborate drawings while in the process of designing and inventing.

Ways of sharing ideas and thinking which were most disliked were: talking as a whole class, showing an example, and talking to a teacher (I'll try not to take it personally). The sad fact is that, with so little time, I often fall back on a quick, whole group sharing about whatever it is we've just done. This survey clearly reinforces the need to move away from that model and try to develop other methods and habits. I've never felt that these group discussions have been much use. In fact, I've often been deeply dissatisfied with the level of participation and involvement of students. It's usually a huge struggle to keep the group together and listening to one another's ideas. It's a little humbling to admit that it's something I've been aware of, unhappy about, and yet haven't done anything in a systematic fashion to work out better ways of doing things. I guess that's what action research is all about.

### **Taking Action**

My first move was to make a pact with myself to quit the whole-class discussion habit. I would try a variety of other approaches to dialog and discussion. I spent time reading and talking with other teachers about alternative techniques, and pushed myself to be more creative and take more time in my planning to consider this aspect of a lesson. It's very easy when planning a hands-on science lesson to spend a lot of time thinking about materials and content, and not give enough thought to how students will discuss or write about their ideas. I made a conscious effort to reverse this.

As an end-of unit review, I came up with a way to have my fifth-grade classes pair up randomly and discuss what they'd learned over the course of the unit. I had each student pick a chess piece. There are four of each kind, and of the four, two are black, two are white (if there was an odd number of students, I'd throw in another which would match one already in the mix). Then, students were asked to find a person with the same type and same color piece, get together and brainstorm what they remembered about the unit. They had about four minutes, after which I asked them to write some of what they'd come up with in their journals. Next, they were asked to find a person with the same type piece but the opposite color and brainstorm again, as well as sharing with their new partner anything interesting they'd come up with from the previous partner. We went through two more pairings: different piece/same color, different piece/different color.

A number of things about this structure were interesting. Most importantly, the level of engagement of the class was remarkable, especially when considered in contrast to what would have taken place in a whole class discussion. As I looked and listened, I noted that most of the students were either talking about the topic or listening intently. Because of the randomness of the pairings, there were some cases where students were reluctant to work together...boy-girl issues or other concerns, but mostly students were accepting of the pairings. The structure did allow a greater range of choice once we got past the first pairing, so students who wanted to could find someone they felt more comfortable with if they worked at it.

Curious to find out whether all this talking in pairs would translate into greater comfort sharing with the group, I tried wrapping up the activity with a short class review. I asked them to contribute ideas toward a concept map that I drew on the board. As usual, there were a few students who were eager to participate while the majority kept to themselves, even though their journals were full of ideas they'd written down. At the end of the session, I explained to students that I'd had them partner up in this way as a response to what I'd learned from the surveys. Then I asked them to tell me how they'd liked the format. Responses were very positive - they liked getting to talk in pairs, with different people. They claimed they learned more by doing it this way.

Another method I began experimenting with involved having one student from each table move from group to group, having a brief discussion of their thinking about a

previously observed phenomenon (salt water floating on plain water in a test tube) with the students remaining at the table. Before moving, all students had time to write and/or draw in their journal as a means of coming up with an idea. The instructions given were that they could use their journal to help explain the idea if they wanted to. Again, as I surveyed the room, nearly all students were intently listening or talking. As I listened to group exchanges, I typically heard students responding to one another's ideas, agreeing, questioning, and comparing ideas. Some students used their illustrations to explain their thinking: some read word for word from their journals. For those students who for a variety of reasons hadn't yet developed an idea to share, (they'd come in late, just weren't tuned in yet, etc.) this format drew them in, compelled them to take on ideas they heard and make them their own.

After the rotation was complete, I asked if anyone wanted to share an idea - their own, one they heard from someone else, or one they heard frequently. Many students were willing to speak up about the ideas they had heard, often pulling together common ideas into a well-developed hypothesis. This proved to be a powerful way to spark their interest in experimenting further and attempting to "figure out" what was happening in the test tube. When I questioned the students as to how they liked the discussion format, they were again very positive and seemed to appreciate the fact that I was making changes in response to the survey results.

Over the last month, I have continued to tinker with various permutations of small group or dyad sharing formats, to my continuing delight. As I move my own voice away from the center of attention, I feel freed up to listen in on what my students are saying to each other as they seem to be freed up to *say more*. As I have greater opportunity to hear their ideas, I feel better equipped to guide them toward the next step in discovery or understanding of a given topic.

With the insight gained from the surveys, I've begun to also make changes in the way we use the journals. I've made it more explicit to students that if they ever want to use their journal to write a note to me regarding anything - their feelings about the class, something going on in their lives, etc. - they should do so and make sure to tell me to read it. So far, there haven't been any shocking revelations, but it can't hurt to let them know that this is an option. When I'd planned an activity that took the entire hour and left

no time for writing, I asked a classroom teacher if she'd be willing to have students take journals back to class and take time later to write reflections. She was more than willing, and with more time to write the students' responses were much more complete and in depth than usual. This also had the added benefit of giving the teacher a chance to read through the journals, which she found very useful in evaluating her students (and myself) that the most important function of the science journal is to help them make sense and think more clearly about whatever it is we're up to.

### **What Now?**

As the deadline for my Action Research paper looms, I continue to experiment with various ways of structuring conversations and writing activities. Some of the approaches I've been using have been so effective, I've begun to use them routinely. My students are getting used to the idea of sending out one member of their group to rotate to all the other tables to share ideas and compare notes. We have fun devising criteria for deciding which person will go - who is the youngest, who has the most siblings, etc. For some lessons, I've tried putting more emphasis on using their journals as a tool to make their ideas explicit, with more drawings and diagrams. This is an approach I intend to use more extensively with other units.

Along with discussions of ideas and observations, I've set up some lessons that had students discussing topics with a little more room for controversy or debate. In one situation, students did three experiments, came up with their own explanations for what they observed, and then chose one of the three. They then formed groups based upon which experiment they chose, and had to discuss and debate their explanations. I told them to try to reach agreement on one explanation. This proved to be very difficult, as some students were very attached to their ideas, but the discussions were lively and thoughtful - just what I wanted.

Clearly, there are many ways to get at the kind of 'minds-on' activity I'm aiming for in my science lessons. I've been finding many good sources for ideas and will continue to 'play' with various approaches. There are still many issues to grapple with, such as how to more fully involve students with low English proficiency. It's an

interesting and inspiring experiment, one that I'm sure to continue with long after this year.

### **Reflections on Action Research**

At the initial Action Research meeting, I felt a huge sense of anticipation and relief. I was finally going to have some time and space to talk with other teachers, to get support, inspiration, and maybe even do a little healthy kvetching. You see, as a specials teacher, I have very little opportunity to do this at school. I'm not a part of the grade level teams or "pods". I rarely have a forum for structured discussion of what I'm doing in my classroom and what I might do to improve. So, I was thrilled to be in an action research group.

As the process developed, and I started to investigate my question, I found myself nagged by the feeling that I *should have* taken time to dig into all this without the benefit of the action research process. Why did I need a half a day a month, a small group of teachers, and a couple of facilitators to get me to tune into what I *should* have already known, should have done already. "Don't be so hard on yourself!" my cohorts told me, "We all get stuck in our patterns and need to step back sometimes and take a look at what we could change." They're right, but still I hope that having had the luxury of being in an action research group can carry me through the coming years with a refreshed sense of how to build that time and habit of mind into the intense, wonderful craziness of classroom teaching.

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